

High Performance, High Temperature Thermoelectrics

Completed Technology Project (2015 - 2016)



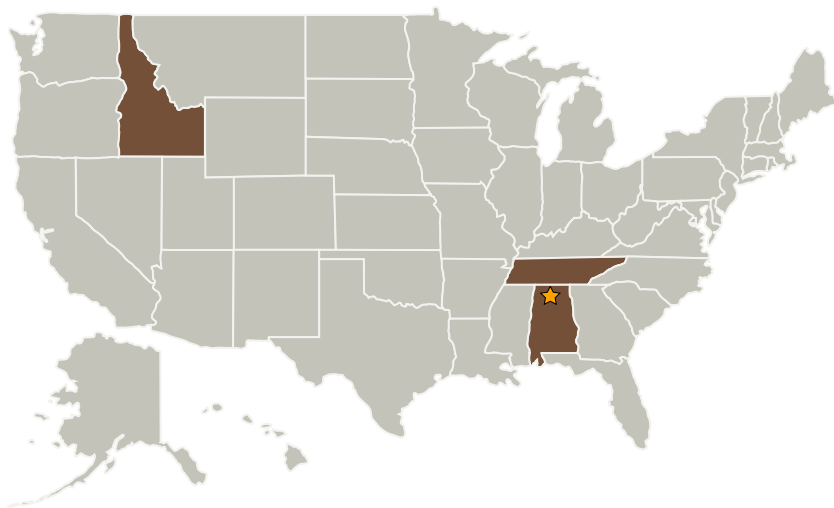
Project Introduction

To address this technology need, it is proposed to develop an enhanced thermoelectric material with advantages that include ease of manufacture, low cost, low toxicity, higher temperature capability (up to 1500C) and much higher ZT figure of merit (>0.5). Specifically, this research will entail coating nano-sized BaTiO₃ particles with appropriate coatings to produce n-doped and p-doped semiconductors. The samples will be prepared using a Direct Current Sintering (DCS) furnace which will allow production of thermoelectric materials which have nano-sized grains. The goal is to increase the ZT value above 0.5 in this study. To decrease thermal conductivity, nano-sized powders will be micro-milled to approximately 30 nm before coating with 5-10 nm layer. Sintering in the DCS furnace will be done to ensure that grain growth does not occur.

Anticipated Benefits

Develop a thermoelectric material for a device with many potential applications for unmanned and manned spaceflight, as well as DoD and commercial applications.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Sakai Company	Supporting Organization	Industry	
VaporPulse Technologies	Supporting Organization	Industry	

Primary U.S. Work Locations	
Alabama	Idaho
Tennessee	

Project Website:
<https://www.nasa.gov/directorates/spacetech/home/index.html>
Organizational Responsibility**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Center Innovation Fund: MSFC CIF

Project Management**Program Director:**

Michael R Lapointe

Program Manager:

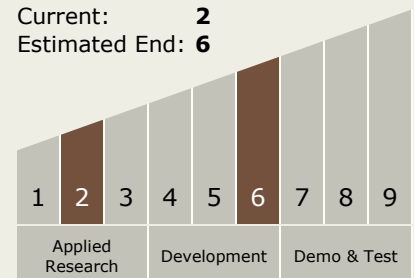
John W Dankanich

Principal Investigator:

Dennis S Tucker

Technology Maturity (TRL)

Start: 2
 Current: 2
 Estimated End: 6



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines